

LESSON 13 – AIR TO GROUND BASICS

Controlling the skies is important only in so much as to allow us to do the mission that will win the war – bombing the snot out of the enemy.

Reading:

11-F16 Sec 5.5-5.5.3 (pp. 125-127)

F-4 Conventional Weapons Delivery Handout Sec 2-1 through 3-2 (pp 2-1 to 3-6)

Problems/Questions:

Work on Problem Set 2

Objectives:

- 13-1 Be familiar with general types of surface-to air threats.
- 13-2 Know the advantages and disadvantages of low and medium altitude ingresses.
- 13-3 Understand the basic types of bomb deliveries and the advantages and disadvantages of each.

Last Time: Air-to-Air Tournament

Today: Surface-to-air threats
SAMs and AAA
Getting to the target
Low vs. medium/high altitude ingress
What do you do once you're there?
Three types of dumb bomb deliveries

Air-to-Air is without question the most fun part of flying fighters. In fact, for some fighter pilots with somewhat more limited skills than others, it's the *only* game they play. However, wars are not won exclusively by blowing the enemy's planes out of the sky, no matter how much fun that may be. To win, you have to put bombs on target so that the ground troops can eventually go in to mop up what little mess remains.

Aerial engagements may be compared to honorable single combat of knights during the age of chivalry. In both engagements, two highly skilled warriors of the elite class battle to the death.

Air to ground engagements are much less chivalrous. They're much more analogous to the scenes in *Braveheart* where the cavalry attacks the infantry. The rules are less gallant, and the combat much more in-your-face. When attacking the mud, the biggest surface threats come from AAA and SAMs. AAA, or anti-aircraft artillery, is basically a bunch of big to really big bullets being fired up at you from relatively poorly trained ground pounders. It only takes one golden BB to totally ruin your day. As for SAMs, they generally

come in the same two flavors that are used in air-to-air missiles: radar guided and heat-seeking. Heaters are generally much shorter range with fairly low maximum effective altitudes, and may be small enough to be transported by a single soldier (MANPADs, shoulder-mounted heat seeking SAMs). Radar guided SAMs are much longer range (up to several *hundred* miles) and can fly much higher than any air-breathing aircraft. Many of them have visually-guided firing modes for use when ARMs (anti-radiation missiles—missiles that guide on the SAM radar emissions) are a threat.

Getting to the target involves a choice of ingress altitude, a choice that involves many tradeoffs. High/medium altitude can significantly increase range, but decreases maneuverability in case you need to defend against a SAM. It also considerably increases the range at which ground radars will be able to detect you. It also puts you above the range of many weapons with which the bad guys will be trying to kill you. Coming in high also takes a lot less concentration than a low-altitude ingress.

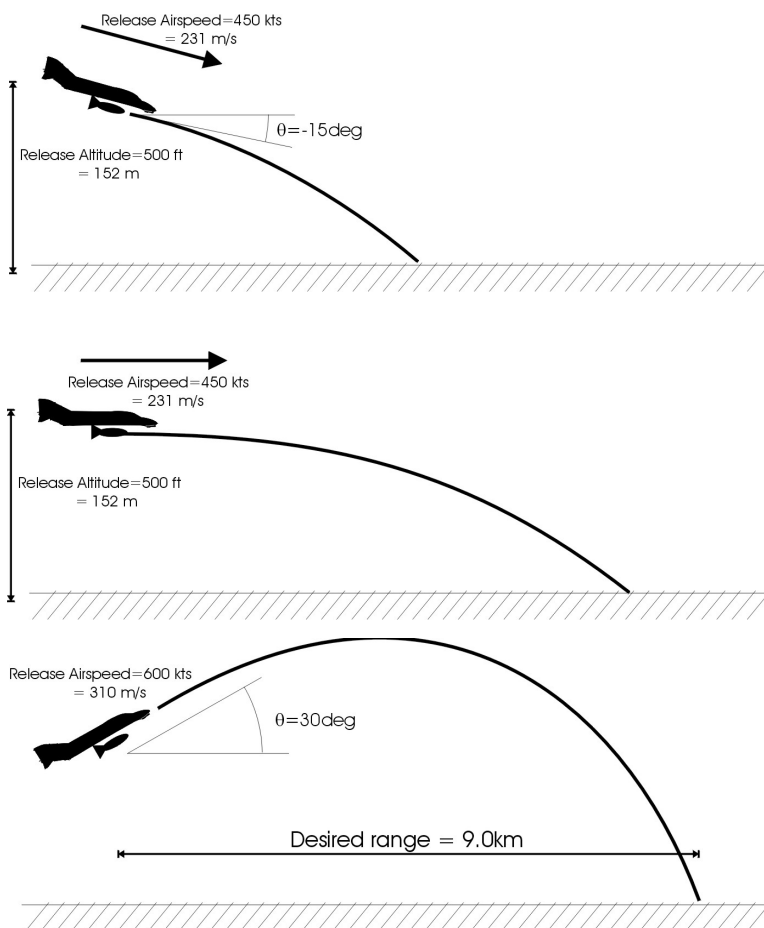
Low altitude allows you to take advantage of terrain masking. It decreases the effective range of not only the first contact by ground-based search radars, but it decreases the effective range of SAMs. The downsides are that it takes a tremendous amount of concentration to fly low, it's pretty easy to get lost (should your computer navigation not be completely accurate), it puts you in range of many more threats, and decreases your jet's range significantly. The BIG upside is that low altitude is a BLAST (one that you'll never experience if you get stuck with an Eagle or Raptor). There's *nothing* like the rush that comes from flying below 300' at over 700 miles an hour jinking in and out of the mountains.

As usual, the nature of the threat usually dictates the type of ingress you'll use. Prior to the Gulf War, almost all training was done for low-altitude ingress. The Soviets had an unbelievable number of SAMs stationed all along their front lines. The only way to survive was to wind your way at low altitude between the threats. Going high meant certain death.

The extraordinary success of the Wild Weasels during the opening days of the Gulf War changed those tactics markedly. With the radar-guided SAM threat virtually eliminated and the Iraqi Air Force unable to operate offensively, the airspace above 15,000 feet was completely threat-free. At the same time, the densities of short-range MANPADs and AAA were such that low altitude ingress was extremely hazardous. To validate this thesis,

just look at which aircraft were lost during the war. Combat losses were primarily British Tornados, who insisted on using low-altitude ingress while dropping their Durendel runway demolishing munitions. They were shot down like ducks on a pond. There were *no* (zero, nada, zip) combat losses of high/medium-altitude aircraft during the entire war when the Weasels were on station.

Once you're near the target, then what? Well, as you learned in Physics 110, there are basically three different types of bomb deliveries available to you. We'll only discuss unguided, unpowered gravity bombs (i.e., "dumb bombs", the weapon of choice for Viper drivers everywhere) in this course. Of course, bombs of infinitely greater sophistication are available, but their complexity hides the basic physics behind attacking the mud. Once you understand the basics, the more complicated systems will be a piece of cake for you to understand.



The three types of deliveries are all related to the aircraft's flight path with respect to the ground. If the flight path is parallel with the ground, it's a level delivery; if you're climbing, you're doing a loft delivery; descend, and you're doing a dive delivery. There are advantages/disadvantages to each type of delivery. We'll discuss these in class.